



**AMENDMENTS TO THE CLAIMS**

**This listing of claims will replace all prior versions and listings of claims in the application:**

**LISTING OF CLAIMS:**

1. (previously presented): A method for modifying a refractive index of an optical wave-guide device having a core section doped with  $\text{GeO}_2$  and a clad section, said method comprising the steps of:

condensing ultra short pulse laser rays having a pulse width not more than 30 pico-seconds using an objective lens,

irradiating to at least one of the core section and the clad section, and

saturating the change of the refractive index of the core section;

wherein the ultra short pulse laser rays are irradiated, while scanned along the core section at least one time, to the core section of the optical wave-guide to modify and saturate the refractive index thereof;

wherein the laser rays are irradiated to the core section for heating the core section as well as for modifying the refractive index of the core section, thereby making thermal treatment unnecessary.

2. (original): The method as defined in claims 1, wherein the ultra short pulse laser rays have photon energy lower than half of band-gap energy of a material of the clad section.

Claims 3-5 (canceled).

6. (Original) The method as defined in claim 1, wherein the core section includes a plurality of stacked layers or a three-dimensional structure, and the ultra short pulse laser rays are irradiated to the bottom part of the core section to modify the refractive index thereof without changing the refractive index of the top part of the core section.

7. (Original) The method as defined in claim 1, whereby the refractive index of the irradiated part is elevated by increasing a density of the irradiated part.

8. (Original) The method as defined in claim 1, wherein the refractive index of the irradiated part is reduced by decreasing a density of the irradiated part or producing holes therein.

Claim 9 (Canceled).

10. (previously presented): The method as defined in claim 1, wherein the laser rays having a power density for saturating the change of the refractive index of the core section are irradiated.

11 and 12. (Canceled).

13. (Original) The method as defined in claim 1, wherein the shape of the core section transmitting the rays is changed to have a taper.

14. (previously presented): The method as defined in claim 1, wherein the core section includes a grating for diffracting rays transmitted in the core section to any direction.

15. (previously presented): The method as defined in claim 1, wherein the core section for guiding the rays and doped with  $\text{GeO}_2$  in the optical wave-guide device includes a planar slab wave-guide which is subjected to the refractive index modification.

16. (previously presented): The method as defined in claim 1, wherein the core section of at least one optical wave-guide and a section of coupling rays of a coupler is subjected to the refractive index modification.

17. (previously presented): The method as defined in claim 1, wherein the optical wave-guide device includes an array wave guide grating for dividing multiplexed rays used for WDM optical telecommunication and binding the divided rays, and the refractive index is modified such that a ray having a specified wavelength is coupled to the optical wave-guide.

18. (Original) The method as defined in claim 1, wherein the optical wave-guide device includes a fiber grating for diffracting a ray having a specified wavelength and the refractive index of the grating is modified by the specified wavelength.

Claims 19-24 (canceled)

25. (currently amended): An apparatus for modifying a refractive index of an optical wave-guide device comprising:

a stage section for holding and moving the optical wave-guide device in “x”, “y” and “z” directions;

a lasing section for emitting laser rays having a pulse width not more than 30 pico-seconds used for modifying the refractive index of a core section; and

an optical system section for irradiating the laser rays lased in the lasing section on the core section of the optical wave-guide device in “x”, “y” and “z” directions,

wherein said optical wave-guide device includes a planar slab wave-guide, and

at least a portion of a surface shape of the optical-planar slab wave-guide, said portion being irradiated with the laser rays, is convex to act as a lens to focus the irradiated rays to the core section of the optical wave-guide.

26. (currently amended): The apparatus as defined in claim ~~19~~ 25, further comprising a chamber for mounting the stage section, the lasing section and the optical system section therein.

Amendment Under 37 C.F.R. § 1.116  
U.S. Appln No. 09/788,621

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**AMENDMENTS TO THE DRAWINGS**

Attachment: **Substitute Formal Drawings** (with 6 sheets of drawings including Fig. 6 and 12-20).